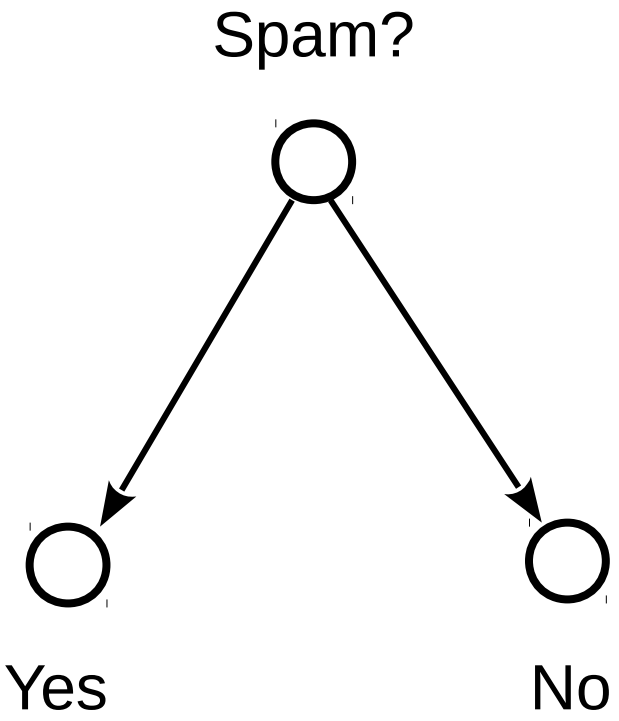
Commodity Machine Learning

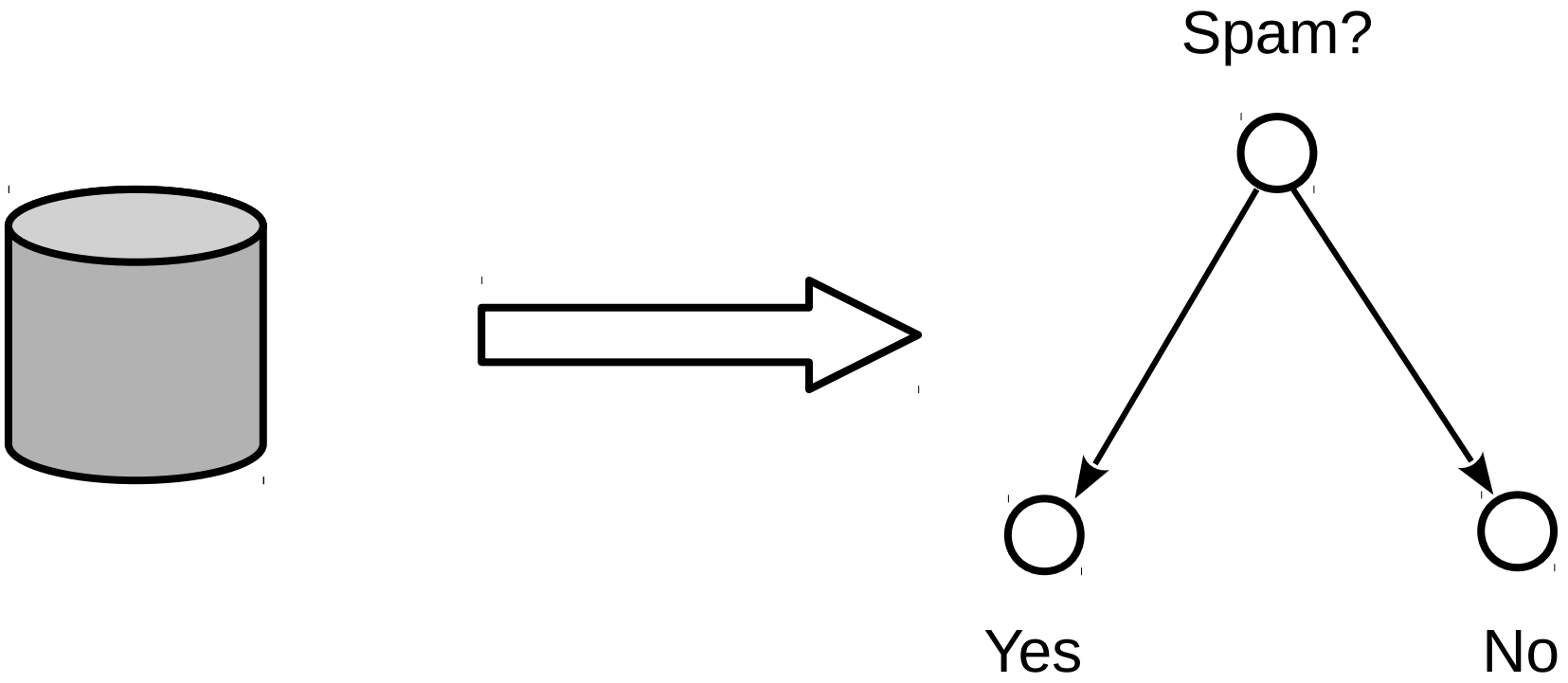
Past, present and future

Andreas Mueller

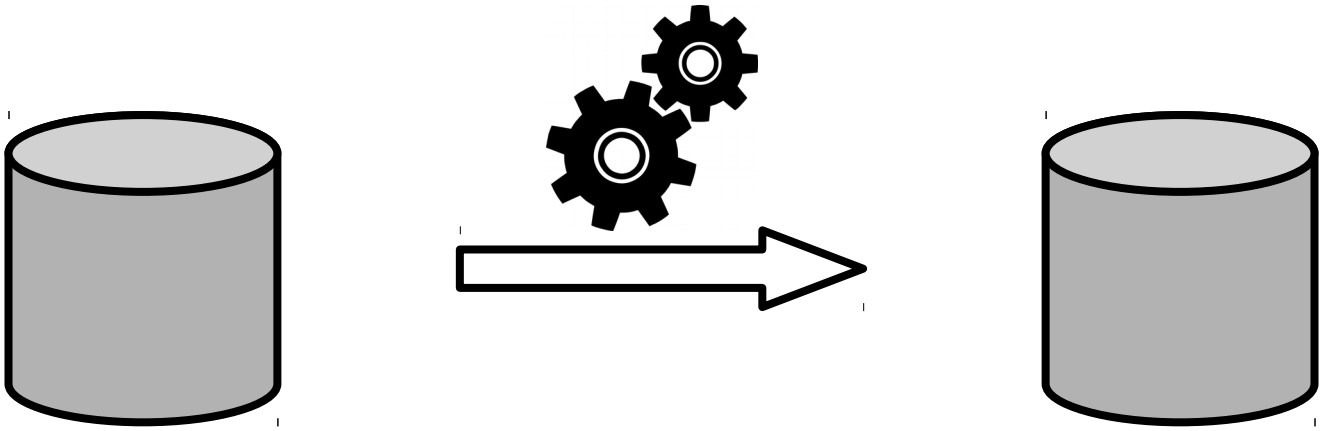
What is machine learning?

Automatic Decision Making

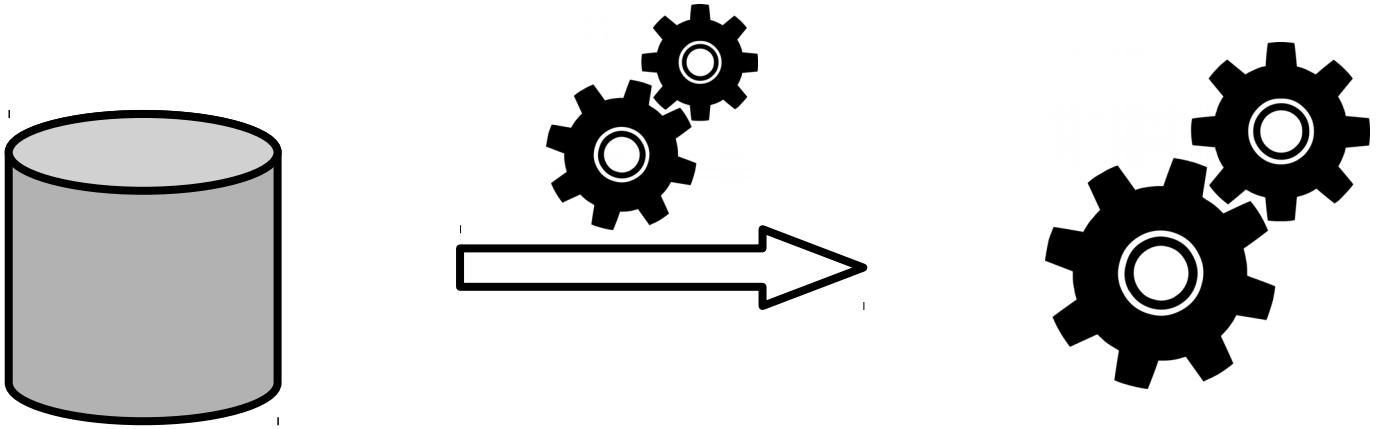



Spam?
Yes
No

Programming



Machine Learning



Machine learning is EVERYWHERE

Search for people, places and things

Andreas | Home

Andreas Mueller
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- **News Feed**
- Messages
- Events 1

GROUPS

- Amazon Machine L... 5
- Surprise 6
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- VERSCHENK'S - ... 20+
- Hochzeitsgeschenk 6
- Mein nächster großer ...
- Berlin Startup Jobs 20+
- Create Group

APPS

- Games
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- Cities I've Visited
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- Games Feed 20+

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- Close Friends 20+
- Berlin, Germany A... 20+

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- Pages and Public Fig...

PAGES

Update Status | Add Photos/Video

What's on your mind?

[redacted]
21 mins ·

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Ab 12:21.30 http://www.twitch.tv/taketv/b/536234505

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Write a comment...

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12 hrs · Twitter ·

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INSTAGRAM

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Mit Johannes Oerding u.v.m. EINTRITT FREI. 14.6. 18-22h direkt vor der O2 World Berlin.

Saturday, June 14 at 6:00pm

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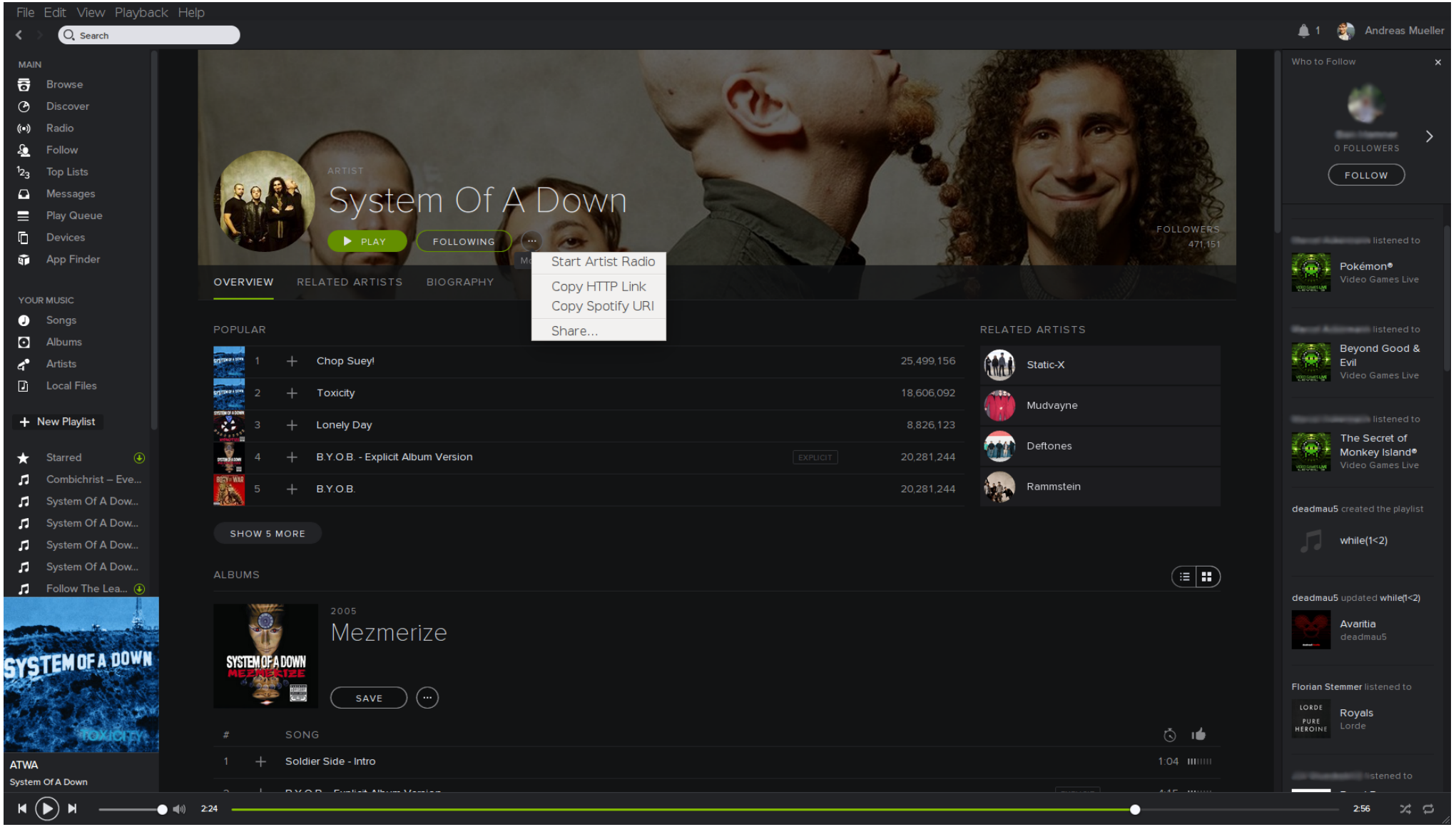
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Share...
OVERVIEW
RELATED ARTISTS
BIOGRAPHY
POPULAR
1 Chop Suey! 25,499,156
2 Toxicity 18,606,092
3 Lonely Day 8,826,123
4 B.Y.O.B. - Explicit Album Version EXPLICIT 20,281,244
5 B.Y.O.B. 20,281,244
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2005
Mezmerize
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1 Soldier Side - Intro 1:04
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0 FOLLOWERS
FOLLOW
listened to
Pokémon®
Video Games Live
listened to
Beyond Good & Evil
Video Games Live
listened to
The Secret of Monkey Island®
Video Games Live
deadmau5 created the playlist
while(1<2)
deadmau5 updated while(1<2)
Avaritia
deadmau5
Florian Stemmer listened to
Royals
Lorde
2:24
2:56

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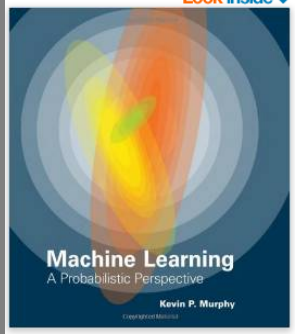

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Machine Learning: A Probabilistic Perspective (Adaptive Computation and Machine Learning series) Hardcover

by Kevin P. Murphy (Author)

★★★★☆ 31 customer reviews

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Today's Web-enabled deluge of electronic data calls for automated methods of data analysis. Machine learning provides these, developing methods that can automatically detect patterns in data and then use the uncovered patterns to predict future data. This textbook offers a comprehensive and self-contained introduction to the field of machine learning, based on a unified, probabilistic approach. The coverage combines breadth and depth, offering necessary background material on such topics as probability, optimization, and linear algebra as well as discussion of recent developments in the field, including conditional random fields, L1 regularization, and deep learning. The book is written in an informal, accessible style, complete with pseudo-code for the most important algorithms. All topics are copiously illustrated with color images and worked examples drawn from such application domains as

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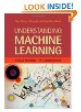
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Commodity machine learning

past

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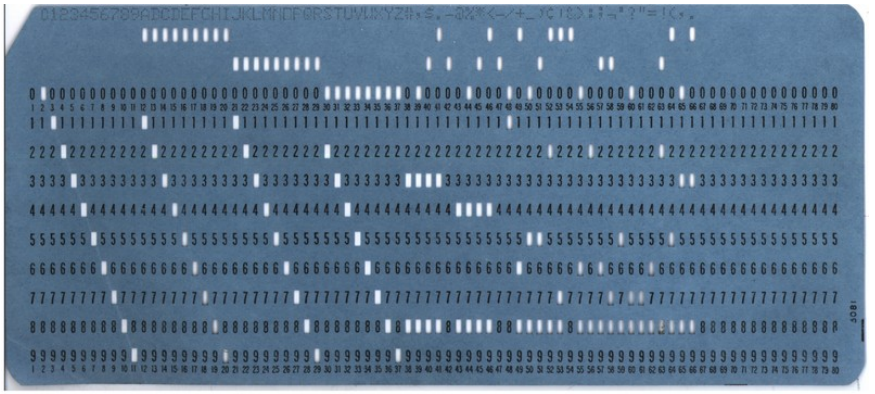
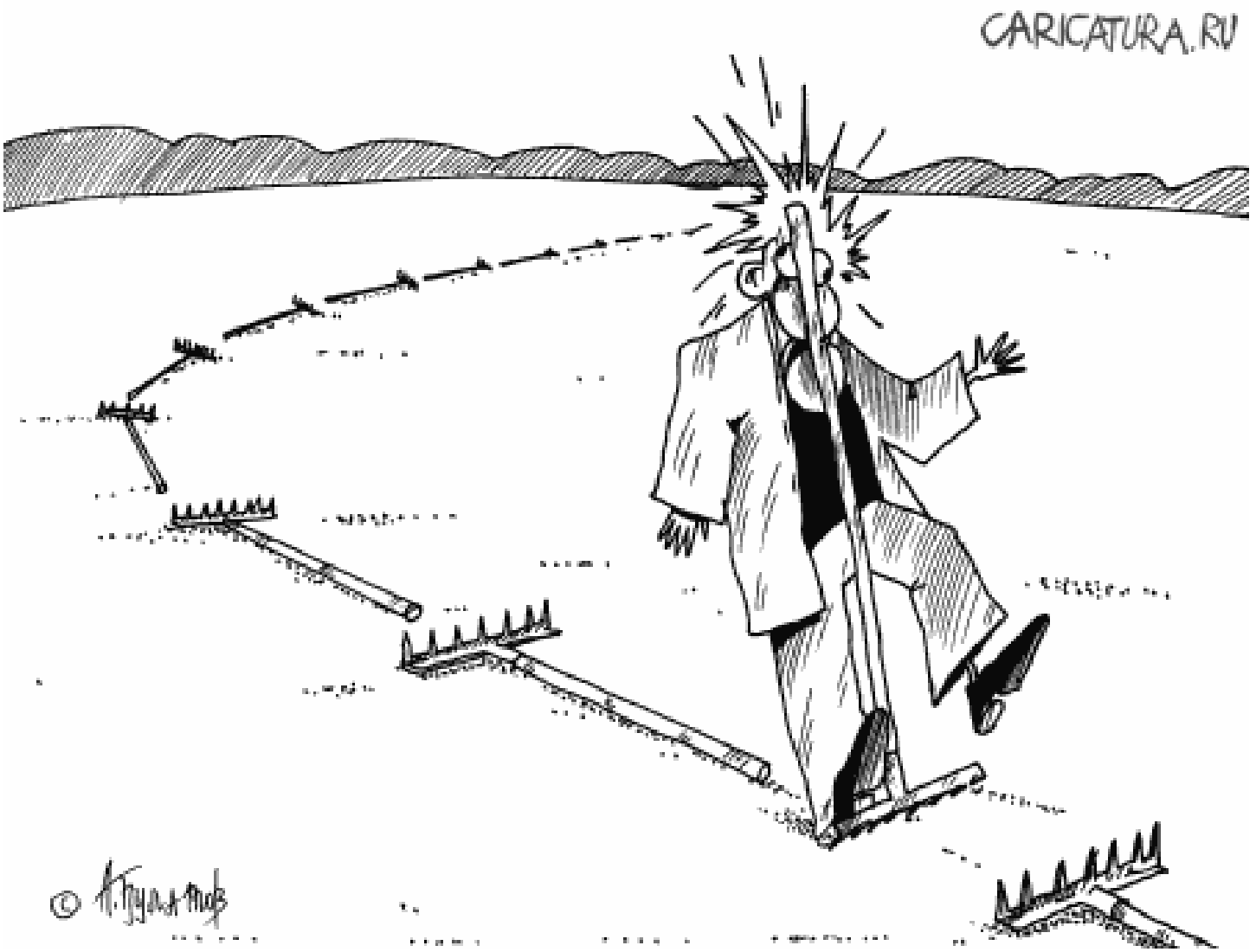



CARICATURA.RU

dawn of open source tools...

The age of shell

Documentation? Testing?

Scikit-learn: User centric machine learning

```
.fit(X, y)
.predict(X)
.transform(X)
```

present

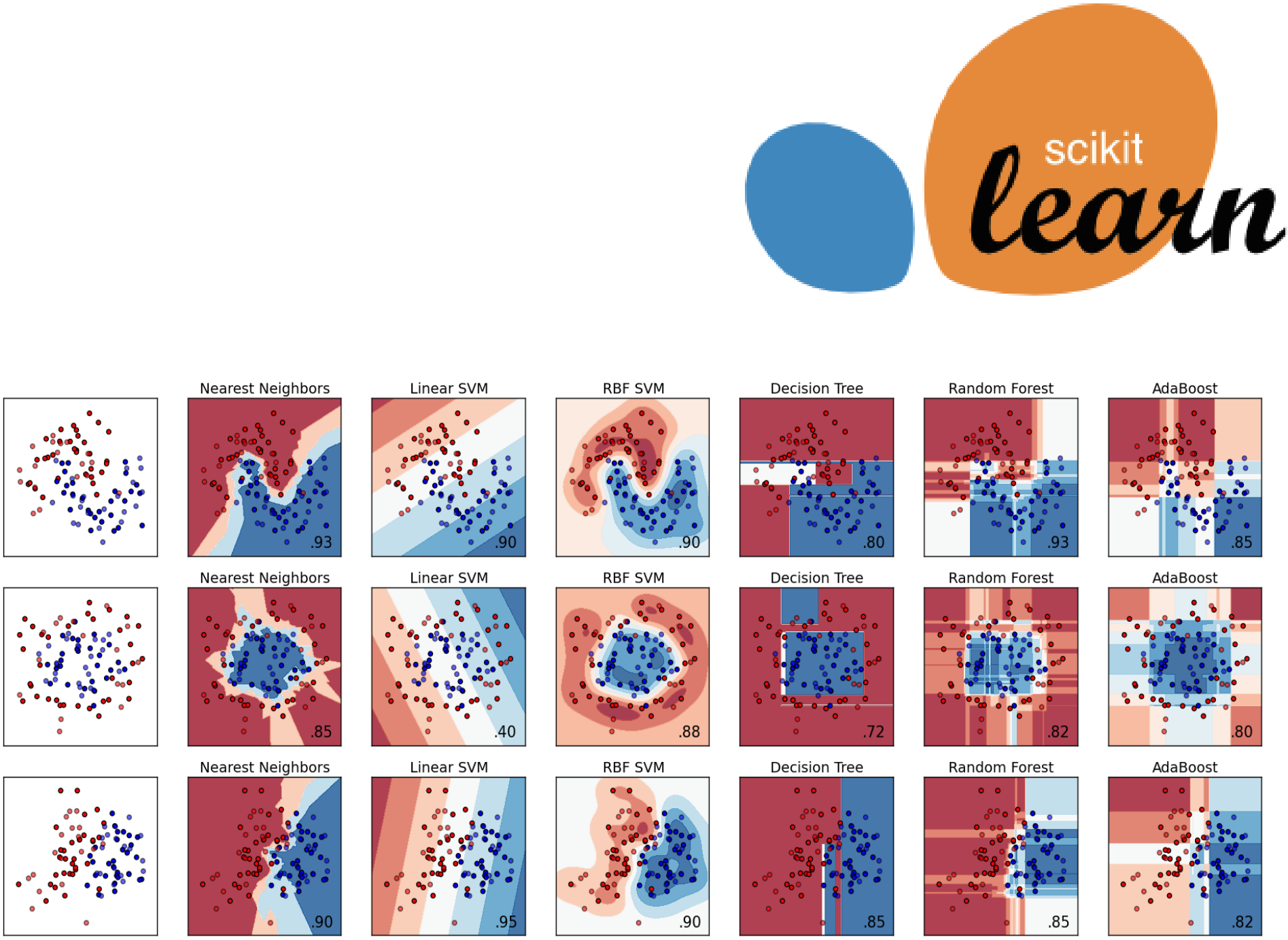
Choose your ecosystem.

Open! Documented! Tested!

Usability is key!

ML Frameworks

PyMC, Edward, Stan
theano, tensorflow, keras


Nearest Neighbors
Linear SVM
RBF SVM
Decision Tree
Random Forest
AdaBoost
.93
.90
.90
.80
.93
.85
Nearest Neighbors
Linear SVM
RBF SVM
Decision Tree
Random Forest
AdaBoost
.85
.40
.88
.72
.82
.80
Nearest Neighbors
Linear SVM
RBF SVM
Decision Tree
Random Forest
AdaBoost
.90
.95
.90
.85
.85
.82

```
from sklearn.model_selection import GridSearchCV
from sklearn.pipeline import Pipeline
```

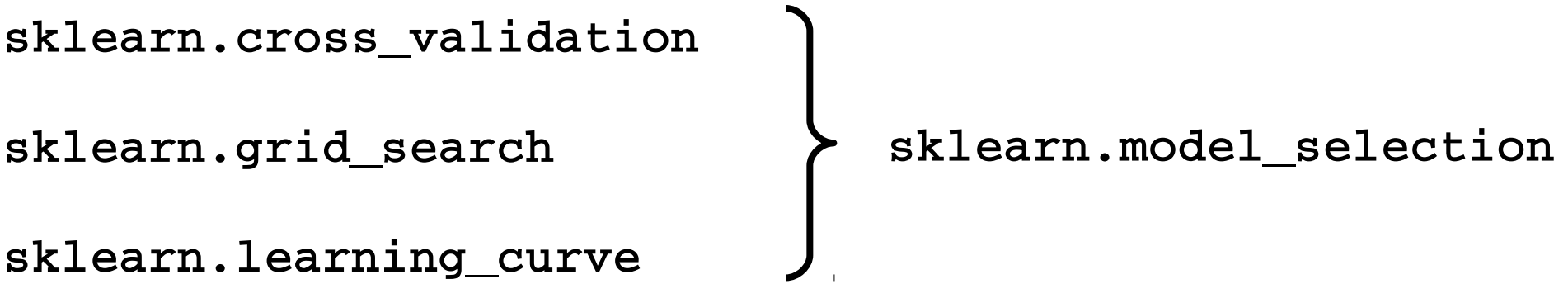
github.com/scikit-learn-contrib/scikit-learn-contrib

(near) Future

0.18

for the release candidate:

```
pip install scikit-learn==0.18rc2
```


sklearn.cross_validation
sklearn.grid_search
sklearn.learning_curve
sklearn.model_selection

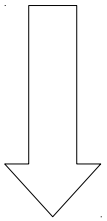
```
results = pd.DataFrame(grid_search.results_)
```

	mean_test_score	param_C	param_gamma	params	...	split2_test_score	split3_test_score	split4_test_score	std_test_score
0	0.37	0.001	0.001	{'C': 0.001, 'gamma': 0.001}	...	0.36	0.36	0.38	0.01
1	0.37	0.001	0.01	{'C': 0.001, 'gamma': 0.01}	...	0.36	0.36	0.38	0.01
2	0.37	0.001	0.1	{'C': 0.001, 'gamma': 0.1}	...	0.36	0.36	0.38	0.01
3	0.37	0.001	1	{'C': 0.001, 'gamma': 1}	...	0.36	0.36	0.38	0.01
4	0.37	0.001	10	{'C': 0.001, 'gamma': 10}	...	0.36	0.36	0.38	0.01

labels → groups

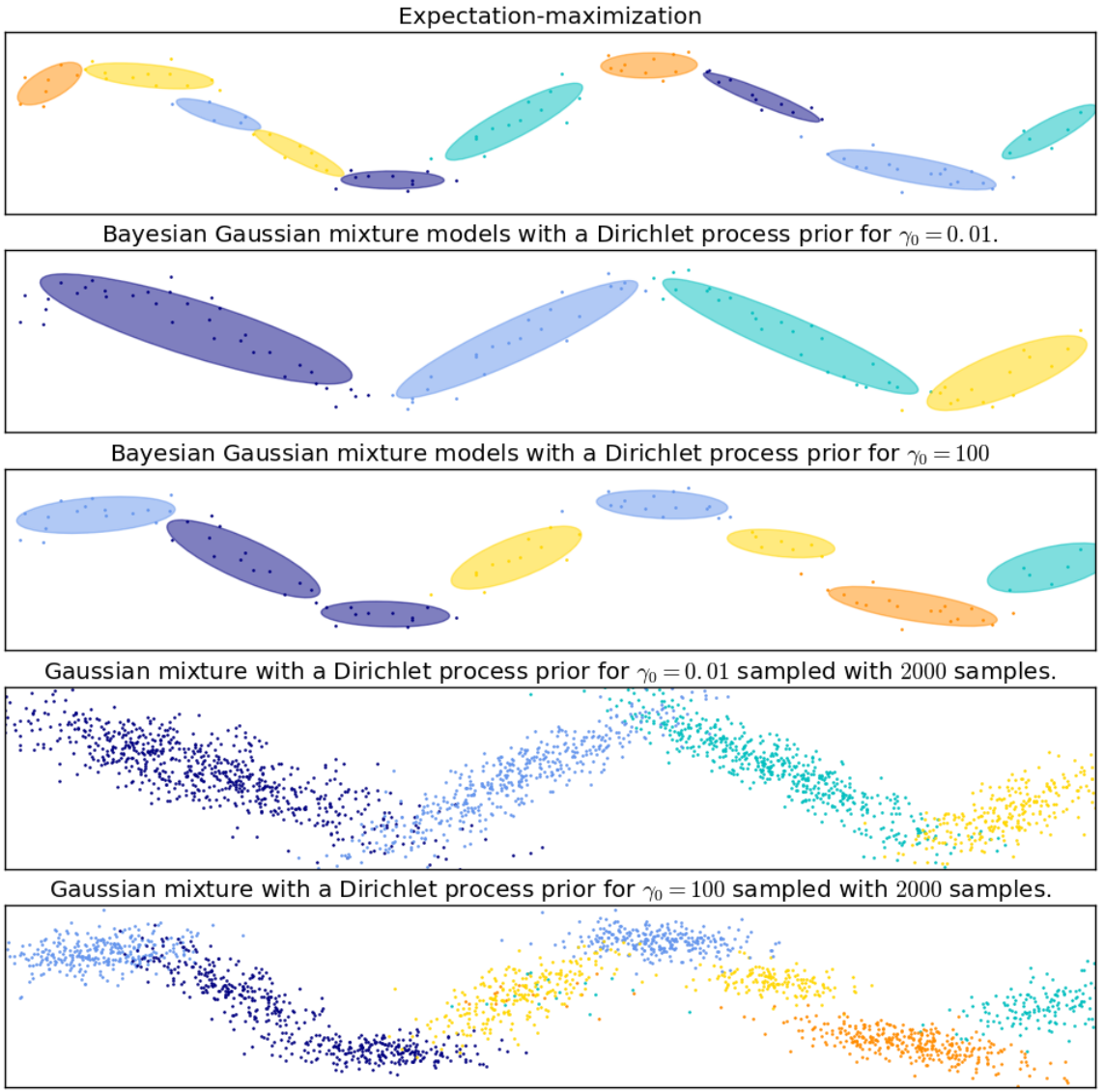
n_folds → n_splits

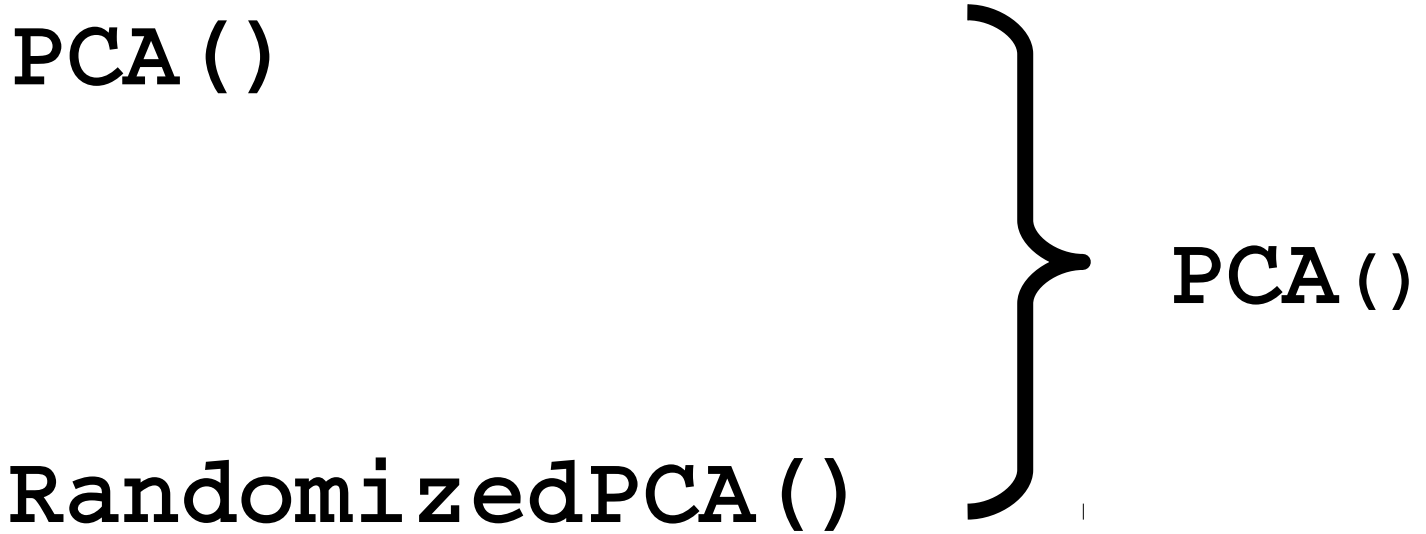
```
from sklearn.cross_validation import KFold
cv = KFold(n_samples, n_folds)
for train, test in cv:
    ...
```



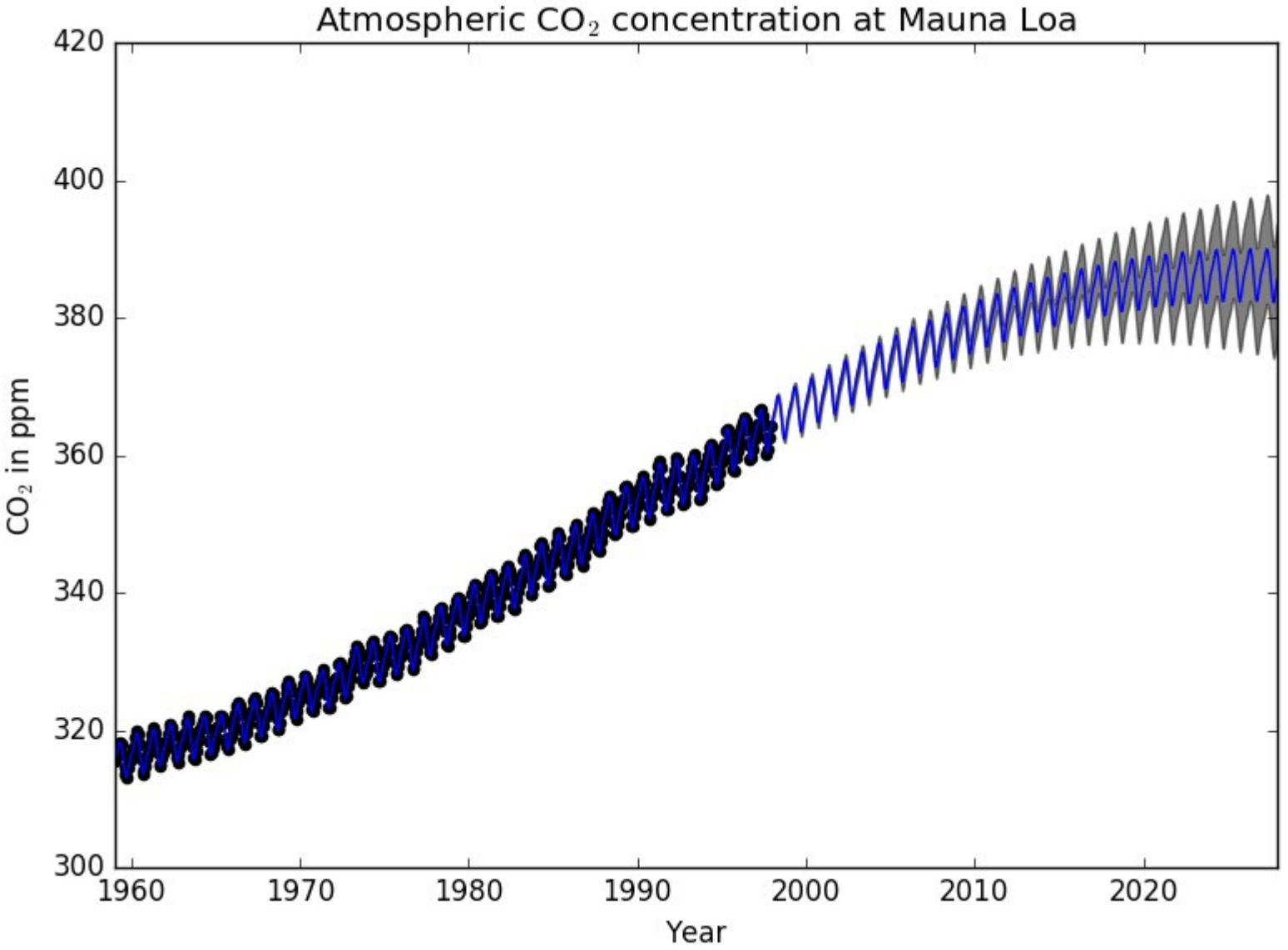
```
from sklearn.model_selection import KFold
cv = KFold(n_folds)
for train, test in cv.split(X, y):
    ...
```

```
from sklearn.mixture import GaussianMixture
from sklearn.mixture import BayesianGaussianMixture
```

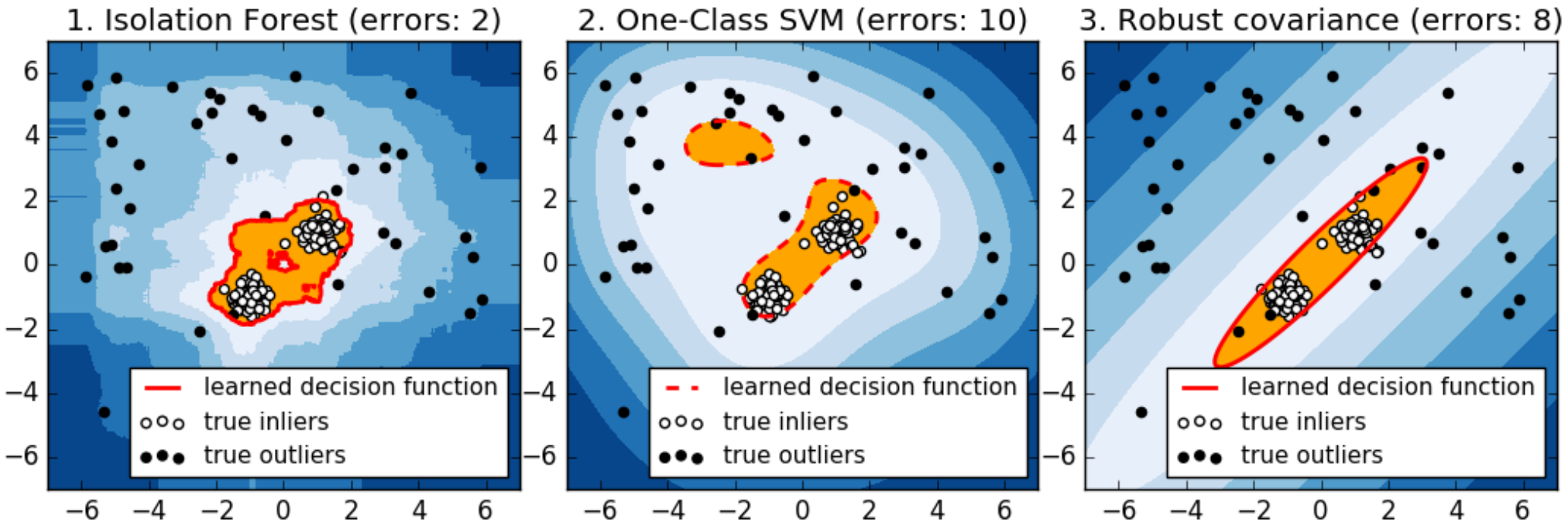



PCA()
RandomizedPCA()
PCA()

Gaussian Process Rewrite



Isolation Forests



Play

```
from sklearn.neural_network import MLPClassifier
```

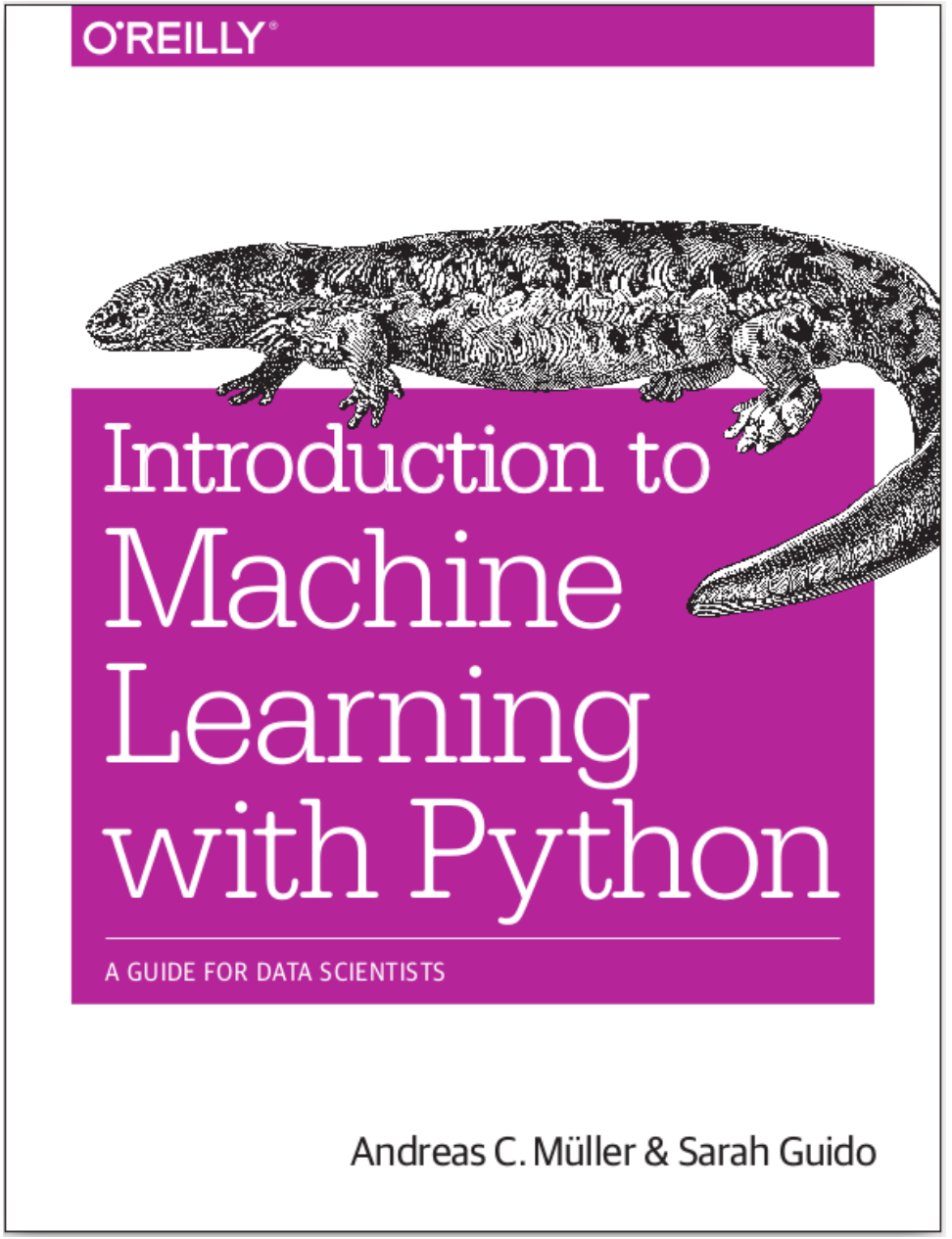
Work

```
import keras
```

```
pipe = Pipeline([('preprocessing', StandardScaler()),
                 ('classifier', SVC())])

param_grid = {'preprocessing': [StandardScaler(), None]}

grid = GridSearchCV(pipe, param_grid)
```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Introduction to
Machine
Learning
with Python
A GUIDE FOR DATA SCIENTISTS
Andreas C. Müller & Sarah Guido

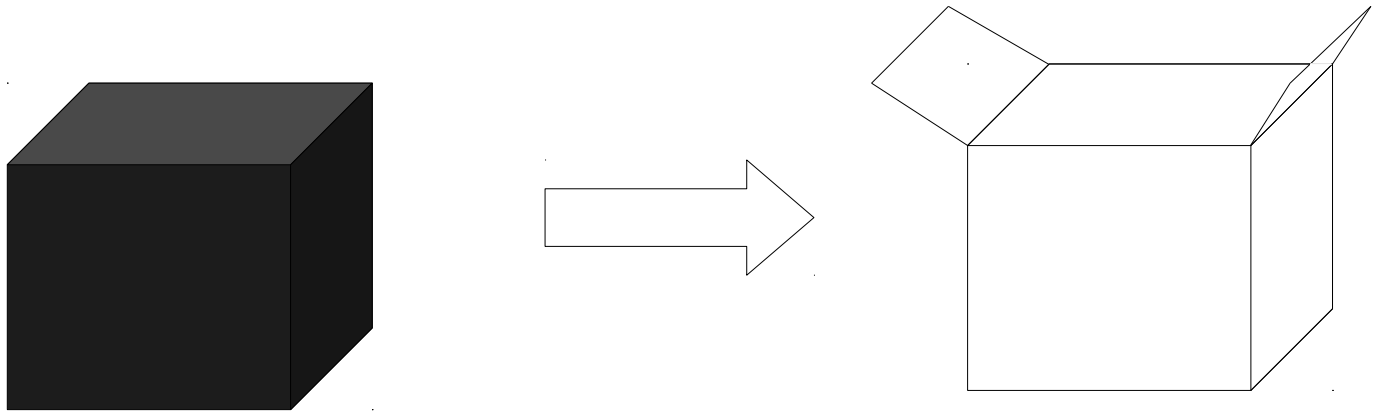
(further) Future

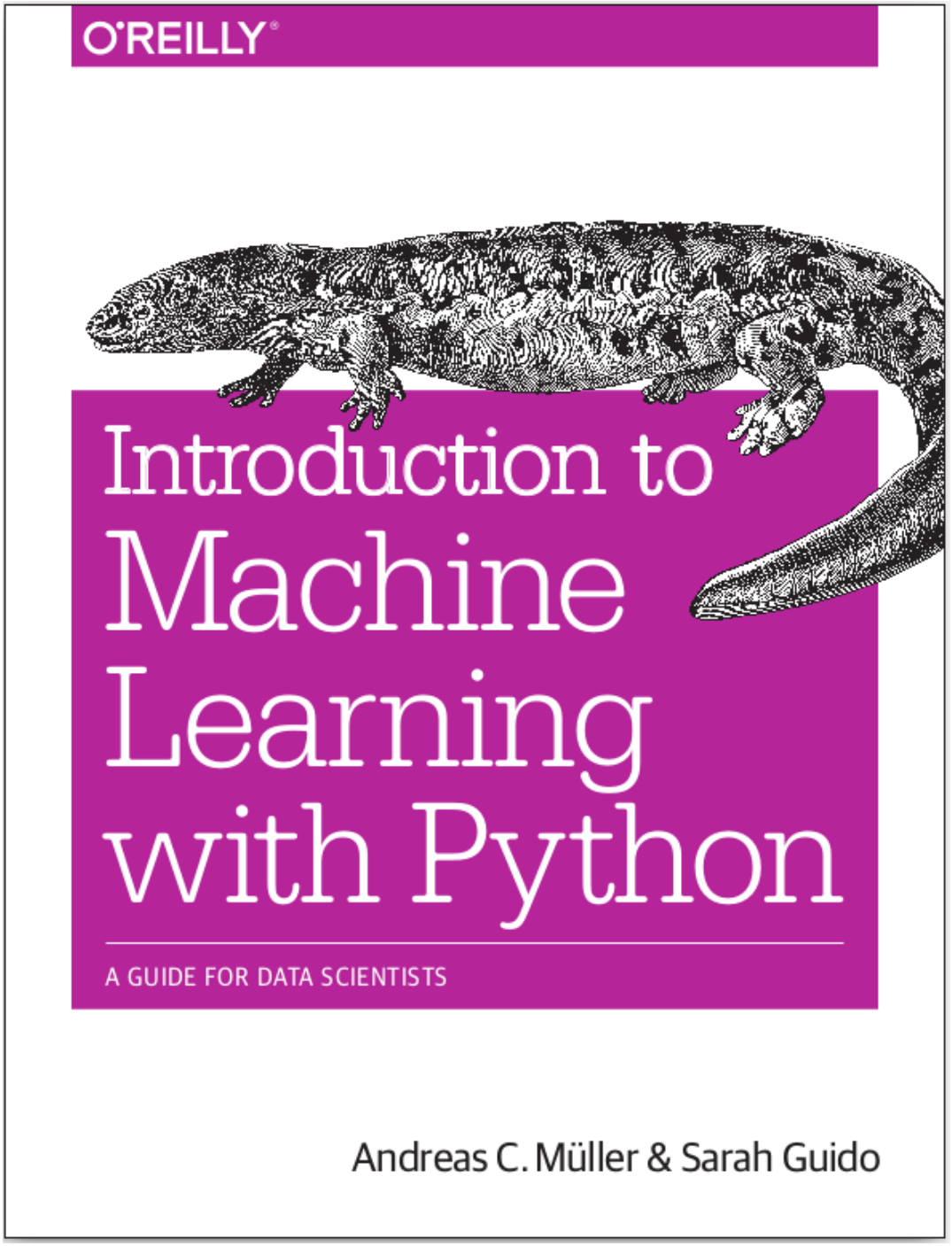
Feature / Column names

```
from __future__ import sklearn.plotting
```

```
from __future__ import AutoClassifier
```

More Transparency





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